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them, prodigious variety in the modes and designs of such dwelling-places. Some are capable of erecting for themselves commodious apartments to live in, as shell-fish, even out of their own constituent parts as they grow. Others lodge their young in the very skins of animals ; and where there are any, who have neither sagacity nor strength enough to provide places for themselves, they are at least taught by their Maker to find them ready made.

Such are the bounds set to our intellectual powers here, that we can have no means of judging of objects, which do not immediately fall under our inspection, but by comparing them to something else, as near them as may be ; or by considering their proportions and effects ; what is probable, what is not, in the phænomena, that belong to them ; and what absurdities may arise from the uses and actions ascribed to them ; for certainly they may be easily seen, by considering the objects themselves.

I would neither conclude, with M. Peyssonnel, that, because I found animals upon such bodies as he mentions, they were the makers of such bodies ; nor that, if one or more kinds of those bodies were actually the work of such creatures, all others, that had any relation to them, must also be their work ; any more than I would, on the other hand, conclude, that, because one or more of these submarine substances were not made by them, none at all were produced by them. I would rather examine the parts of those bodies in as nice and scrupulous a manner as possible, and compare their characteristics with those of other bodies in both the animal and vegetable kingdoms ; and, by finding out some of
their

their properties only, be, in a great measure, able to range them in the rank, which they were designed to hold by Divine Providence.

In order to this, let us see first what are those animals, which we are acquainted with, who certainly fabricate their dwelling-places, as they grow for themselves; and what the common or usual advantages are, which they are in general observ'd to be endow'd with; which will be best done, by taking a near view of them. All the testaceous tribe, whether of land or water, and whatever their forms be, may be said to produce their own habitations, but not to fabricate them. For we must observe, there are but two modes, by which these kinds of animals are furnished with them; the one by secretion from themselves, and these necessarily grow with them; the other by a design'd apposition of parts of the animals themselves. Now, in the first case, there is a necessity for a just proportion between the animal itself, and the shelly matter secreted from it. It must be large enough, and have stability and strength in proportion to the matter which it secretes, and is to move about with; and it will appear, that this is the general rule thro' nature: Or, if it be an immoveable body, the creature ought certainly to be allow'd so much significancy and strength, as would, on the one hand, seem necessary for the secretion of so much matter, as was sufficient to constitute that body; or, on the other, to be capable, by its own proper action, of gathering together the matter, and building up the structure. Where this is wanting, I, for my own part, would be far from hastily concluding such work to be the fabrication of such

seemingly weakly insignificant animals; more especially if, upon these very bodies, there were appearances of other characteristics, that, at the same time, were likely to lead me into another arrangement of them.

I have produc'd here before you such of the shell-animals, as are unquestionably the makers of their own houses, that are furnish'd with these requisites mention'd; and others I shall now offer you, being somewhat nearer those said to form the coral, &c. than other testaceous kinds.

The *dentalia* are tubular shells, formed from their inhabitant animal, as much as a cockle, or an oyster: and we must observe, that each of these has a sufficient cavity for its habitation, and in itself has the proportional size and strength necessary for the purpose.

The *vermiculi marini* enjoy the same privileges, and are always attach'd to their shells at their posterior extremities, as well as the others, of whatsoever kind. They are found in groups, adhering together by a natural cement; blended, and, as it were, confounded together; and yet every one has its own cell, and is sufficient to produce in those requisites before-mention'd. All the kinds of these have one extremity small, and increase in diameter to the anterior extremity; which is indeed the case of all the turbinated fish of whatsoever kind. To these we may add, that the crusts of crustaceous animals, and those of insects in their chrysalis state, will always shew, how necessarily an animal must have power and sufficiency to form his habitation, either by secretion, or actual operation.

The *syringoides*, so call'd from their forms, carry the same testimonies of their strength and power;
many

many species of which we find fossil, of which I have the honour to shew several specimens: And I have no doubt, but it will be hard to find any creatures more deficient, or, in other words, more abandon'd to destruction by the Creator, than these, in any part of nature.

Whatever is constructed by an animal, that is, among those, that we know with any certainty, it is surely to dwell in themselves, or to deposit eggs or young in. There was really no need to build a fabric to dwell upon; because all those creatures, such as the polypi of every kind, which attach themselves to bodies, have innumerable sorts of matter, to which they can adhere every-where, near them: And if these of the sea have, in their nature and properties, any analogy with our fresh-water polypi, as to their propagation, and the detachment of their young from themselves; with the several kinds of the same genus, the *polypes à panache*, *polypes à bouquet*, the bell-like polypi, and every other kind, discover'd by our ingenious observer Mr. Trembley, all which detach their young from them nearly in the same manner; one would almost be persuaded, that they were never intended to dwell in cavities, but upon *nidus's* convenient for their attachment only, with full liberty, at proper times, to detach their young in like manner; who immediately meet some or other of these submarine bodies for their security also; for indeed there is hardly room to suppose any other way of propagation for these, than for those of M. Trembley, since they are much of the same substance and consistency every way. And it must be remark'd, that few or no animals, that have
shells

shells of any kind, can ever quit them, but must remain in them till they die.

We are now, secondly, to consider some of the most obvious marks, that distinguish vegetable from other substances.

Whatever body is fixed by its root, no matter, whether it be flat or fibrous, increasing upwards, and ramifying into smaller and smaller branches, till they become more and more pointed to their extremities ; having fibres either apparently tubular, or only porous or woody, would incline one, who had at all made the works of nature his study, rather to favour the idea of a vegetable in such a body, than that of any other production. If these characteristics are common to any of the species of corals, corallines, madrepores, &c. it would be no wonder they ow'd their increase to a kind of vegetation ; nor would their hardness weigh at all against it, because every one knows, that water is the universal vehicle of all matter into bodies of this kind. It is by water, that the testaceous matter is carried into the juices of shell'd fish, and from it detach'd into the order we see it in the shells. It is from water, that sparry incrustations upon vegetables are made : It is a deposit from water, that lines our common tea-kettles with a sparry crust : And it is also this fluid, that conveys the particles of tartar into the grape, which is afterwards deposited upon the sides of the wine-vessel ; and no doubt but it is water, which carries up into those hard bodies their stony matter ; for there can be no doubt of their being organized bodies. Besides, tho' the organization, in its origin, is probably flexible enough, yet the arrangement of these

these petrific particles in so exact a manner would inevitably render the whole hard enough, in the course of its growth. Is not the shell of a common egg hard enough? and yet its membrane, into the cells of which the testaceous particles were secreted and ranged, in order to produce that hardness, was soft enough before.

If we were to make transverse sections of the generality of these bodies, we should see a regular radiated order of pores from their central medullary pipes, some foliated, others more tubular, others barely porous, all differing from one another only according to their own natures. What more is there in the order of the fibres of trees or plants? Transverse sections of any of these will shew you the most beautiful figures, in such orders, that can be conceiv'd; which, long ago, that accurate and learned naturalist Dr. Grew has ingeniously observ'd, in his *Anatomy of Plants*, where he has given elegant figures of such sections in a variety of examples. And altho' some of these bodies have their pipes and pores quite stopp'd up, as they grow, yet their external appearance will shew them fibrose.

In like manner some trees are so very hard, from the strong connection of their parts, that, in a transverse section, neither pores nor fibres can be distinguish'd; and they are as susceptible of a fine polish as any stone. And indeed it would seem to me much more difficult to conceive, that so fine an arrangement of parts, such masses as these bodies consist of, and such regular ramifications in some, and such well-contriv'd organs to serve for vegetation in others, should be the operations of little, poor, helpless, jelly-

jelly-like animals, rather than the work of more sure vegetation, which carries on the growth of the tallest and largest trees with the same natural ease and influence, as the minutest plant, in a manner, which I have elsewhere explain'd.

Is it not also somewhat particular, that, if corals are the work of these insects, there should be no cavity left behind them, as they raise it into branches; but that they should leave it solid within? And would it not be very surprising, that such cellular passages, as we see diversified into many kinds, should be made by these creatures from the basis, to be left behind them, as they carry up the building, without any further purpose, in brain-stones, &c? If this was the case, and that these little creatures could be supposed to build them, there would be a deviation from the general uniformity and purpose, that is observ'd every-where else: For certainly cells are built by every animal to deposit something; eggs, young, or other matter, in them; neither of which can be said of the insects in question.

It has been said, that flies, wasps, and bees, build themselves cells; in order to make a comparison between them and these polypi. They do so; but is there no distinction to be made? I can find several. Bees, wasps, &c. are in themselves, compact strong animals, well made for the work allotted them, very able to bring and put together the materials of their nests; and when they have done their work, that proportion between the fabric, and the creatures which raised it, is apparent, which all nature points out, and the purpose is fulfilled soon, in their filling them with what nature had destin'd they should

should hold. But can this be said of our polypi? Where is that proportion between a little configured jelly, and the mass of matter said to be their work? What is deposited in the cells they form? What makes others solid? And how do these jellies so wonderfully dispose the fine arrangement of pores, fibres, nodes, branches, &c.? And to what purpose, if they could be supposed capable of it? In a word, I humbly purpose to sum up this essay in two general sentiments; and these will be the rule, by which I, for my own part, shall always judge of things of this nature; *viz.*

1. Whatever bodies shall be found to carry the appearances and characteristic marks of vegetables; even tho' animals are found upon them, they certainly will pass with me for such, till stronger evidence shall evince the contrary. And,

2. I shall ever expect to see, at least, a seeming power, proportion, and stability, in animals, to render them capable of performing what they may be thought to have done. I am,

S I R,

With the utmost respect,

Yours and the Society's

most obedient servant;

J. Parsons.